K113847

APR 11 2012

510(k) Summary of Safety and Effectiveness

This 510(k) summary of safety and effectiveness information is being submitted in accordance with the requirement of SMDA 1990 and 21 CFR 807.92.

1) **Submitter's Name:** Gold Standard Diagnostics
   Address: 2851 Spafford St. Davis, CA. 95618
   Phone Number: 530-759-8000
   Contact Person: Napoleon Monce
   Date: April 5, 2012

2) **Product and Trade Name:** *Borrelia burgdorferi* IgG B31 Line Blot Test Kit
   Common Name or Classification Name: *Borrelia burgdorferi* IgG Western blot
   Product Code: LSR

3) **Legally marketed device to which the submitter claims equivalence**
   B. burgdorferi (IgG) Marblot Strip Test System (Distributed by Trinity Biotech) for the qualitative detection of human IgG antibody to individual proteins of *Borrelia burgdorferi* in human serum. The system is intended for use in testing human serum samples which have been found positive or equivocal using and EIA or IFA test procedure (K950829).

4) **Description of the device**
   The assay requires a total of 70 minutes incubation time. The test uses purified antigens coated on nitrocellulose strips. Serum is added to each strip and incubated for 30 minutes. If *Borrelia burgdorferi* antibodies are present they will bind to the antigens on the strips. Unbound serum is removed by washing the wells three times. An enzyme-conjugated anti-human IgG is then added to each strip and incubated for 30 minutes. If antibody is present, it will bind to the antibody attached to the antigen on the strip. The wells are again washed three times followed by a DI water wash to remove any unbound conjugate. After unbound conjugate has been removed by a further washing step, a visualization of the antigen-antibody-antibody complex is accomplished by the addition of a substrate which forms blue-violet precipitates at each site (antigen bands). The reaction is stopped by washing the nitrocellulose strip with distilled or deionized water. Depending on the observed band pattern one can interpret the presence or absence of specific IgG antibodies to *B. burgdorferi* infection.

5) **Intended use of the device**

The Gold Standard Diagnostics *Borrelia burgdorferi* B31 IgG Line Blot Test Kit is intended for the qualitative detection of IgG antibodies to *B. burgdorferi sensu stricto* (B31) in human serum. This test is intended for use in testing human serum samples which have been found positive or equivocal using an ELISA or IFA test procedure to provide supportive evidence of infection with *B. burgdorferi.*

6) **Comparison with the predicate device**

The Gold Standard Diagnostics *Borrelia Burgdorferi* B31 IgG Line Blot Test Kit was compared to a commercially marketed kit by Trinity Biotech the *B. burgdorferi* (IgG) Marblot Strip Test System (K950829). Both kits have the same intended use and use the same methodology. Below are tables comparing the reagents and the procedures of the two devices.

Table 1: Reagent Comparison

Gold Standard Diagnostics *B. burgdorferi* *B31* IgG Line Blot Test Kit	**Trinity Biotech *B. burgdorferi* (IgG) Marblot Strip Test**
Antigen coated nitrocellulose strips	Antigen coated nitrocellulose strips
Diluent/Wash Concentrate – 10x	Diluent/Wash Concentrate – 10x
IgG Conjugate – 100x	IgG Conjugate – 10x
Substrate – BCIP/NBT	Substrate
IgG Positive Control	IgG Band Locator Control
IgG Cutoff Control	IgG Weak Reactive Control
IgG Negative Control	IgG Negative Control
Diluent/Wash Concentrate – 10x	Diluent/Wash Concentrate – 10x

Table 2: Procedure Comparison

Gold Standard Diagnostics *B. burgdorferi* *B31* IgG Line Blot Test Kit	**Trinity Biotech *B. burgdorferi* (IgG) Marblot Strip Test**
Dilute Samples 1:101 in Diluent/Wash	Dilute Samples 1:101 in Diluent/Wash
Add 15ul of Samples	Add 20ul of Samples
Incubate for 30 minutes while rocking	Incubate for 30 minutes while rocking
Wash three times with reconstituted Diluent/Wash Solution	Wash three times with reconstituted Diluent/Wash Solution
Add 1.5ml of reconstituted Conjugate	Add 2ml of reconstituted Conjugate
Incubate for 30 minutes while rocking	Incubate for 15 minutes while rocking
Wash three times with reconstituted Diluent/Wash Solution	Wash three times with reconstituted Diluent/Wash Solution
Wash one time with DI water	Wash one time with DI water
Add 1.5ml of Substrate	Add 2ml of Substrate
Incubate for 10 minutes ± 3 minutes while rocking	Incubate for 4-12 minutes while rocking
Wash three times with 1.5ml DI water	Wash three times with 2.0ml DI water

7) Nonclinical Tests

Reproducibility

The reproducibility of the assay was done by testing a negative sample, a high negative sample, a low positive sample, and a moderate positive sample in triplicate for five days, twice a day, at three sites with two technicians per site giving a total of 30 data points per sample. Results of band reproducibility and sample reproducibility are shown below:

Band Reproducibility:

Sample/kDa	93	66	58	45	41	39	30	28	23	18	Number of Bands
Negative					90				90		<4 significant bands
High Negative	90			64	90				90		4 significant bands
Low Positive				90	90	90			79	90	5 significant bands
Moderate Positive	90		90		90	90		90		90	>5 significant bands

Sample Reproducibility:

	Band Reproducibility	Final Interpretation	
		Positive	Negative
Sample			
Negative	100% (180/180)		100% (90/90)
High Negative	92.8% (334/360)		100% (90/90)
Low Positive	97.6% (439/450)	87.8%* (79/90)	
Moderate Positive	100% (540/540)	100% (90/90)	

*A low positive sample is expected to yield a positivity of 95%.

Cross Reactivity

A cross reactivity study was performed on 215 specimens known to contain potentially cross reactive antibodies to *B. burgdorferi*. Sera from patients with infections and sera from patients with diagnoses that can be confused with the late manifestations of Lyme disease were tested. The results are summarized in the following table:

Infection / Diagnosis	Number of Sera Tested	# Positive / (%)
Tick-borne Relapsing Fever / Rickettsial Diseases	23	1 / (4%)
Treponemal Infections	12	0 / (0%)
Ehrlichiosis	20	0 / (0%)
Babesiosis	20	2 / (10%)
Leptospirosis	1	0 / (0%)
Parvovirus B19	9	0 / (0%)
Epstein-Barr Virus	11	0 / (0%)
Cytomegalovirus	32	0 / (0%)
H. pylori	12	0 / (0%)
Fibromyalgia	10	0 / (0%)
Rheumatoid Arthritis	12	0 / (0%)
Herpes Simplex Virus	16	0 / (0%)
Varicella Zoster Virus	12	0 / (0%)
Autoimmune Disease	25	0 / (0%)

Two of the 20 Babesiosis samples and one of the 23 Tick-borne relapsing fever / Rickettsial Disease specimens were positive on the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot Test. These samples were also tested on the predicate device which also gave positive results.

Interfering Substances

The effect of potential interfering substances on samples using the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot Test was evaluated. High levels of hemoglobin, bilirubin, cholesterol and intralipids in serum samples were tested on six sera (two positives, one low positive, one high negative, and two negatives). The recommended concentrations in the guideline "Interference Testing in Clinical Chemistry" from the Clinical and Laboratory Standards Institute were used. The interferents at the concentrations tested did not have any influence on the band pattern. A small variability in band intensity was seen that is in the normal

range of deviation and did not change the final interpretation. The results are summarized in the following table:

Substance	Concentration	Interference
Hemoglobin	2 g/L	None detected
Bilirubin	342 µmol/L	None detected
Cholesterol	13 mmol/L	None detected
Intralipids	37 mmol/L	None detected

Specimen Collection and Handling Conditions

A study was performed to substantiate the specimen storage and handling conditions for the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot Test. Three samples were tested in triplicate after the following storage conditions:

A) 2-8°C for 24, 48, 72, 96, 120, 144 and 168 hours.

B) Room temperature for 2, 6 and 8 hours.

C) After 1, 5 and 10 freeze and thaw cycles.

The samples gave consistent results for all testing parameters above, therefore the specimens can be held at 2-8°C for at least 168 hours or at room temperature for up to 8 hours and withstand up to 10 freeze and thaw cycles.

8) Clinical Testing

Sensitivity Testing

A sensitivity study was performed on 100 clinically characterized samples obtained from Allen C. Steere, MD at the Massachusetts General Hospital. The samples encompass early, disseminated, and late stages of Lyme disease. The results are summarized in the following table:

	Number of Samples	Line Blot Sensitivity with 95% CI	Predicate Device Sensitivity with 95% CI
Early	40	7.5% (3/40) [1.6%-20.4%]	7.5% (3/40) [1.6%-20.4%]
Disseminated	20	60.0% (12/20) [36.1%-80.9%]	60.0% (12/20) [36.1%-80.9%]
Late	40	95.0% (38/40) [83.1%-99.4%]	92.5% (37/40) [79.6%-98.4%]

Analytical Specificity (endemic & non-endemic)

For the determination of analytical specificity, testing of 234 asymptomatic samples (blood donors) from both endemic and non-endemic regions was performed. The results are summarized in the following table:

Region	Number of Samples	Number Positive	Analytical Specificity
Endemic	115	2	98.6%
Non-endemic	119	0	100%

CDC Reference Panel

A standard panel of positive and negative specimens provided by the Center of Disease Control (CDC) for Lyme disease detection was tested both on the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot Test and on the predicate device. The results are summarized in the following table:

Stage	Total	GSD Line Blot % Agreement	Predicate Device % Agreement
Healthy	5	100% (5/5)	100% (5/5)
Early (0-2 months)	15	93.3% (14/15)	100% (15/15)
Intermediate (3-12 months)	13	84.6% (11/13)	76.9% (10/13)
Late (years)	7	100% (7/7)	85.7% (6/7)

Method Comparison

The performance of the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot test was determined by conducting a prospective clinical study at three different geographic sites (Pennsylvania, North Carolina, and California) in the U.S. The patient samples were tested by an anti-*B. burgdorferi* ELISA test first and the resulting equivocal and positive specimens were tested on the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot test and a commercially available *B. burgdorferi* IgG Blot test. The results are summarized in the following table:

		Trinity Biotech IgG Blot	
		Positive	Negative
Gold Standard Diagnostic IgG Line Blot	Positive	112	2
	Negative	1	195

Positive Percent Agreement = 99.1% (112/113) [95% CI: 95.2-100%]
Negative Percent Agreement = 99.0% (195/197) [95% CI: 96.4-99.9%]

The discrepant samples were tested on a second commercially available assay. On the one Line Blot negative sample that was positive by the predicate, the second assay gave a negative result. Of the two Line Blot positive and predicate negative samples, the second assay called one sample negative and the other sample positive.

9) Conclusion

From the performance data and kit comparison above, it is our conclusion that the Gold Standard Diagnostics *B. burgdorferi* B31 IgG Line Blot Test Kit is substantially equivalent to the *B. burgdorferi* (IgG) Marblot Strip Test System (K950829) commercially marketed by Trinity Biotech.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration

10903 New Hampshire Avenue
Silver Spring, MD 20993

Gold Standard Diagnostics
C/O Napoleon Monce
Director, Product Development
2851 Spafford St.
Davis, CA. 95618

APR 11 2012

Re: K113847
Trade/Device Name: *Borrelia burgdorferi* B31 IgG Line Blot Test Kit
Regulation Number: 21 CFR 866.3830
Regulation Name: Treponema pallidum treponemal test reagents
Regulatory Class: Class II
Product Code: LSR
Dated: December 28, 2011
Received: January 18, 2012

Dear Mr. Monce:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration.

If your device is classified (see above) into class II (Special Controls), it may be subject to such additional controls. Existing major regulations affecting your device can be found in Title 21, Code of Federal Regulations (CFR), Parts 800 to 895. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Parts 801 and 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); and good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820). This letter

will allow you to begin marketing your device as described in your Section 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

If you desire specific advice for your device on our labeling regulation (21 CFR Parts 801 and 809), please contact the Office of *In Vitro* Diagnostic Device Evaluation and Safety at (301) 796-5450. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/cdrh/industry/support/index.html.

Sincerely yours,

Sally A. Hojvat, M.Sc., Ph.D.
Director
Division of Microbiology Devices
Office of *In Vitro* Diagnostic Device
Evaluation and Safety
Center for Devices and Radiological Health

Enclosure

Indications for Use

510(k) Number (if-known): K113847

Device Name: *Borrelia burgdorferi* B31 IgG Line Blot Test Kit

Indications For Use:

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Prescription Use X AND/OR Over-The-Counter Use
(Part 21 CFR 801 Subpart D) (21 CFR 807 Subpart C)

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of In Vitro Diagnostic Devices (OIVD)

Division Sign-Off

Office of In Vitro Diagnostic
Device Evaluation and Safety

510(k) K113847